

Remarks

This amendment is responsive to the Office Action mailed June 4, 2003 in connection with the above-identified patent application. In that Action, the Title of the Invention was objected to as not being descriptive. Claims 1 and 7 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,643,525 to Haim in view of U.S. Patent No. 4,632,222 to Itoh, et al. Claim 1 was further rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,128,053 to Brandt, et al. in view of Itoh, et al. Lastly, claims 2-6, 8, and 9 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Brandt, et al. in view of Itoh, et al. and further in view of German Patent No. 33 28 339 to Ostwald.

The Title is Descriptive:

As noted above, the original title of the application was objected to by the Examiner as not being descriptive. Applicant has amended the title of the invention above.

It is respectfully submitted that the new title suggested by the Examiner has been adapted and is believed to be descriptive of the invention.

THE ART REJECTIONS

As noted above, claims 1 and 7 were rejected as being unpatentable over Haim in view of Itoh, et al. Claim 1 was further rejected as being unpatentable over Brandt, et al. in view of Itoh, et al. Lastly, claims 2-6, 8, and 9 were rejected as being unpatentable over Brandt, et al. in view of Itoh, et al. and further in view of German Patent No. 33 28 339 to Ostwald.

The Present Application:

For purposes of review, the present application is directed to a novel liquid crystal display with reflective support member and heating device. One significant advantage provided by the device of the present application is a dramatic simplification of the overall liquid crystal display device with a commensurate reduction in cost. Primarily, these advantages are provided by the device of the present application because no additional components are needed to be installed, added, or otherwise assembled in order to provide a heating device in a liquid crystal display. More particularly, a metallic layer 8 is applied directly onto a support member 2 to provide a heating device in a liquid crystal display which results in a significant simplification of the overall device and, as noted above, a reduction in costs. It is respectfully submitted that none of the prior art cited by the Examiner teaches such a construction or provides similar advantageous results.

One object of the device of the instant application is a liquid crystal cell functioning as a display whereby each cell is heated, even at low temperatures, with a low overall constructional expense. This object is solved in accordance with one specific embodiment of the invention of the application in that the heating device is a metallic layer applied directly onto a plastic support member, the metallic layer being produced by coating the support with a bonding layer, namely a primer, and by a subsequent galvanic coating. None of the art cited by the Examiner teaches this technique or such a construction.

Alternatively, for solving the above-noted object, the manufacturing steps of the metallic layer include coating a foil with a bonding layer and then subsequently galvanic coating the foil, as well as a deep-drawing and a rear-spring of the foil. The metallic layer beneficially serves as a

resistive heating element. By means of this type of metallic layer which is applied directly onto the plastic support, no additional components need to be mounted to provide a heated liquid crystal display. Again, this saves overall costs of the device and simplifies its manufacture.

In accordance with the instant application, in order to provide the support with a metallic layer, a set of alternative techniques are described. A first technique includes coating the support functioning as a reflector with a bonding layer of a primer and then subsequently galvanic coating the bonding layer. In another technique, a foil is coated with a bonding layer of a primer and is subsequently galvanic coating, deep-drawn, and rear-sprayed onto the support.

In addition, alternatively, the support member is manufactured from a metallizable and a non-metallizable plastic with subsequent partial chemical metallization of the support member. The manufacture of the support from two kinds of plastics is accomplished using two-component extrusion methods or the like. In accordance with another alternative, the plastic component is subjected to short-wave radiation, ultra-violet light of an excimer lamp or an excimer laser with an immersion of the radiated plastic in a watery solution with subsequent additional bath steps. The layers applied in this fashion can be electrically contacted and galvanically reinforced to thicknesses customary for conductor tracks.

In a further embodiment of the invention, the contacting with the heating element is effected either by means of pins injected into the plastic support member or by direct metallized plastic surfaces which are soldered together with a conductor plate.

In a further embodiment of the invention such as illustrated in Figure 2, the housing and the support are equipped with a metallic layer as a heating device, the

housing and support being formed as a single piece unitary construction which results in a substantial simplification in the design and a commensurate reduction in costs.

In accordance with the graphic representation according to Fig. 1, inside a housing 10 are arranged a liquid crystal cell functioning as display 1, and a support 2, functioning as reflector. A dispersion foil 5 is arranged in the housing under the display. Housing 10 is closed above a frame 20, for example by means of recesses 15 of frame 20, which are clipped together with catch tongues 25 at the outside of housing 10. A heating device is disposed on support 2 which functions as reflector. The heating device is a metallic layer 8, applied directly onto support 2. In addition, a conductor plate 14 is provided. The metallic layer is produced by coating the support 2, made of plastic, with a bonding layer and by subsequent galvanic coating. The galvanic coating consists, for example, of copper.

Another manufacturing possibility for the metallic layer is described in that a foil is coated with a bonding layer and subsequently galvanically treated, whereby, after that, the foil is deep-drawn and connected with support 2 by rear-spraying.

Another manufacturing possibility for the metallic layer is offered in that the support can be produced for example by two-component spray process from a metal-coatable plastic and a metal non-coatable plastic, with subsequent partial chemical metal-coating of the support.

Alternatively, the possibility also exists that certain locations of the plastic element are radiated with a short-wave ultraviolet light of an Excimer lamp or an Excimer Laser. Subsequent thereto, the plastic is immersed in a watery solution, whereby in further baths, within a brief period of time, develops a continuous copper- or nickel layer.

These layers can be electrically contacted and galvanically reinforced to customary thickness for conductor tracks.

The metallic layer 8 is selectively equipped with contact pins injected into the support 2, which are designed, for example, as metal pins. Another possibility exists in that the contacting is effected directly via metallized plastic surfaces, which are soldered together with the conductor plate.

According to Fig. 2, there also exists the possibility of a single-piece version of the liquid crystal display. In this instance, the conductor plate or the housing 10 is connected as a single piece with the support 2, whereby said support 2 in turn presents, similar as for the embodiment according to Fig. 1, a metallic layer 8, which, similar to the embodiment according to Fig. 1, forms a heating device.

Due to the circumstances that the heating device is a metallic layer 8 applied directly onto the support 2, there results significant simplification of the entire unit and a reduction in costs, since no additional components have to be installed.

Claims 1, 5-9, and 10 are in Condition for Allowance Over the Art of Record:

As noted above, claims 1 and 7 were rejected as being unpatentable over Haim in view of Itoh, et al. Claim 1 was also rejected as being unpatentable over Brandt, et al. in view of Itoh, et al. Lastly, claims 2-6, 8, and 9 were rejected as being unpatentable over Brandt, et al. in view of Itoh, et al. and further in view of Ostwald.

Applicant has amended independent claim 1 to include limitations not taught, suggested, or fairly disclosed in the art of record cited by the Examiner either individually or in combination. More particularly, independent claim 1 recites a liquid crystal display comprising a housing, a liquid

crystal cell functioning as a display disposed on the housing, a plastic support configured as a reflector, and a heating device for the display. The heating device includes a metallic layer applied directly onto the support, the metallic layer being formed by coating the plastic support with a primer bonding layer followed by a subsequent galvanic coating.

Applicant appreciates the Examiner's comment in the Action that the Haim patent fails to disclose a liquid crystal display having a housing. Applicant further submits that the Haim patent does not teach, suggest, or fairly disclose a heating device including a metallic layer applied directly onto a plastic support, the metallic layer being formed by coating the plastic support with a primer bonding layer followed by a subsequent galvanic coating. As noted above, one significant advantage of the device taught in the instant application is a cost savings due in part to a simplified overall device. In the Haim patent, the heating element 21 includes a resistive layer 23 formed on a glass substrate 22. These are additional components in the overall device which costs money and require times and efforts during the manufacturing process. The Itoh, et al. patent does not overcome this deficiency.

Next, with regard to the combination of the Brandt, et al. in view of Itoh, et al. combination advanced by the Examiner, the applicant respectfully thanks the Examiner for indicating in the record that the Brandt, et al. patent fails to disclose a liquid crystal display having a housing on which the liquid crystal cell is disposed. Applicant submits that in addition, the Brandt, et al. patent also fails to disclose a heating device for heating the display including a metallic layer applied directly onto a plastic support, the metallic layer being formed by coating the plastic support with a

primer bonding layer followed by a subsequent galvanic coating.

Next in the Action, original dependent claims 2-6, 8, and 9 were rejected as being unpatentable over the combination of Brandt in view of Itoh and further in view of German Patent '339 to Ostwald. Applicant thanks the Examiner for stating in the record that the Brandt patent fails to disclose a support as a plastic and a metallic layer as a bonding layer applied directly onto the support and a galvanic coating applied onto the bonding layer. However, applicant disagrees with the Examiner's position that the Ostwald patent teaches a plastic support with a metallic layer as a bonding layer applied directly onto a support and a galvanic coating applied onto the bonding layer for use as a heating layer in which the support consists of a metal-coatable and metal non-coatable plastic, and the metal-coatable plastic is in part chemically metallized. Also, applicant respectfully disagrees with the Examiner's combination of the Ostwald teaching with those of Brandt and Itoh as being based on improper hindsight combination.

First, with regard to the Examiner's understanding of the Abstract in the Ostwald '339 patent, the English translation is provided below as follows:

Method of metallising a plastic surface consists of bringing the surface to a temp. which changes the modulus of elasticity of the plastic and thereby enables a mechanical roughening of the surface, chemically roughening the surface and finally metallising the surface by producing a catalytic nucleating layer and electroless metal or alternately coating with a metal foil using a solution of the plastic material as adhesive. Pref. during the mechanical roughening process some of the plastic material is removed. This stage is carried out at essentially below room temps. The chemical roughening is carried out by etching in alkali. When the metallising is carried out using a catalytic layer, a solution containing Sn and Pa

is used to produce the layer prior to electrolessly or galvanically metal coating. When a metal foil is stuck onto the substrate using a solution of the plastic above that of room temp. Soln. contains essentially unpolymerised plastic material.

As can be seen from the above, the English language Abstract of the Ostwald '339 patent does not support the Examiner's position stated in the record. In addition, there is no suggestion in the Abstract of the Ostwald '339 patent that the process disclosed there is useful in any shape or form in a liquid crystal display. In addition, there is not suggestion or teaching in either of the Brandt or Itoh patents of the usefulness of a mechanical surface roughening technique as taught in the Ostwald '339 patent Abstract.

Accordingly, applicant respectfully submits that the Examiner's combination of the Ostwald '339 Abstract with the Brandt and Itoh patents is improper and is based on a reading of understanding of applicant's specification and claims. Further, even if the Ostwald patent was combinable with the primary references, it would fall short of teaching, suggesting, or rendering obvious the limitations which are now recited in independent claim 1 as amended above.

For at least the above reasons, it is respectfully submitted that independent claim 1 and claims 5-9 and 10 dependent therefrom are patentably distinct and unobvious over the art of record.

Claims 3, 4, 11, and 12 are Patentably Distinct and Unobvious Over the References of Record:

As noted above, claims 2-6, 8, and 9 were rejected as being unpatentable over Brandt, et al. in view of Itoh, et al. and further in view of Ostwald.

Applicant has amended claim 3 into independent form to include limitations not taught, suggested, or fairly disclosed in the art of record cited by the Examiner either

individually or in combination. More particularly, independent claim 3 recites a liquid crystal display comprising a housing, a liquid crystal cell functioning as a display disposed on the housing, a plastic support configured as a reflector, and a heating device for the display. The heating device includes a metallic layer applied directly onto the support, the metallic layer being formed by a foil coated with a galvanic bonding layer by deep-drawing and connected with the support by rear-spraying of the foil.

With regard to the combination of the Brandt, et al. in view of Itoh, et al. combination advance by the Examiner, the applicant respectfully thanks the Examiner for indicating in the record that the Brandt, et al. patent fails to disclose a liquid crystal display having a housing on which the liquid crystal cell is disposed. Applicant submits that in addition, the Brandt, et al. patent also fails to disclose a heating device for heating the display including a metallic layer applied directly onto a plastic support, the metallic layer being formed by coating the plastic support with a primer bonding layer followed by a subsequent galvanic coating.

Next in the Action, original dependent claims 2-6, 8, and 9 were rejected as being unpatentable over the combination of Brandt in view of Itoh and further in view of German Patent '339 to Ostwald. Applicant thanks the Examiner for stating in the record that the Brandt patent fails to disclose a support as a plastic and a metallic layer as a bonding layer applied directly onto the support and a galvanic coating applied onto the bonding layer. However, applicant disagrees with the Examiner's position that the Ostwald patent teaches a plastic support with a metallic layer as a bonding layer applied directly onto a support and a galvanic coating applied onto the bonding layer for use as a heating layer in which the support consists of a metal-coatable and metal non-coatable plastic, and the metal-coatable plastic is in part

chemically metallized. Also, applicant respectfully disagrees with the Examiner's combination of the Ostwald teaching with those of Brandt and Itoh as being based on improper hindsight combination.

As argued above, the English language Abstract of the Ostwald '339 patent does not support the Examiner's position in the record. In addition, there is no suggestion in the Abstract of the Ostwald '339 patent that the process disclosed there is useful in any shape or form in a liquid crystal display. In addition, there is not suggestion or teaching in either of the Brandt or Itoh patents of the usefulness of a mechanical surface roughening technique as taught in the Ostwald '339 patent Abstract. Accordingly, applicant respectfully submits that the Examiner's combination of the Ostwald '339 Abstract with the Brandt and Itoh patents is improper and is based on a reading of understanding of applicant's specification and claims. Further, even if the Ostwald patent was combinable with the primary references, it would fall short of teaching, suggesting, or rendering obvious the limitations which are now recited in independent claim 1 as amended above.

For at least the above reasons, it is respectfully submitted that independent claim 3 and claims 4, 11, and 12 dependent therefrom are patentably distinct and unobvious over the art of record.

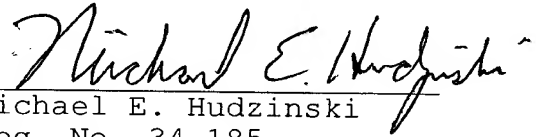
Conclusion

In view of the above amendments, comments, and arguments presented, applicant respectfully submits that all pending claims are patentably distinct and unobvious over the art of record.

Allowance of all pending claims and early notice to that effect is respectfully requested.

Respectfully submitted,

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